Inefficient NGO labels: strategic proliferation and fragmentation in the market for certification

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Abstract

NGO certification is a prerequisite for corporate engagement in enhanced social behaviors in many settings. Labels with broad scope (like 'sustainability') coexist with niche competitors much narrower in scope (like 'bird-friendliness'). When NGOs compete for adoptions the wrong suite of schemes emerges, providing a rationale for regulation. An incumbent NGO may strategically narrow the breadth of its label to deter entry of competing schemes, reducing welfare. Even when entry is accommodated, welfare is compromised. Modeling multi-issue competition between NGOs allows us to be the first to analyze label fragmentation and provide a novel perspective on proliferation that has frustrated practitioners.

Keywords: NGO certification, eco-label, label design, corporate social responsibility.

JEL Classification Numbers: L31, D82, D20.

1 Introduction

In many settings a firm is more profitable if it is seen to behave in a socially responsible way. Some consumers may be willing to pay a premium for its product, a worker might be willing to work for a lower wage, a regulator might be less likely to subject it to the burdens of audit, and so on (e.g., Baron, 2011; Winston, 2015). While this gives profit-motivated firms an instrumental incentive to bundle their products with pro-social behaviors—to engage in what Besley and Ghatak (2007) have called 'retailing public goods'—they often find it difficult to communicate credibly such behavior to outsiders. A firm may *say* that it behaves well, but why should people believe it?

To overcome this information gap firms typically rely on credible non-governmental organizations (NGOs) as certifiers, such that NGO run labeling schemes are now common in the retail landscape.[1] The relationship between firms and their certifiers is symbiotic. An NGO willing to certify a behavior is fundamental for a profit-motivated firm to be willing to engage in it, but equally NGOs that want to achieve impact (Duncan, 2004; Scharf, 2014) rely on their labels being adopted by firms. The social engagement behaviors of firms both influence, and are influenced by, the design of labeling schemes.

Motivated by the real world social labeling context, we develop the first model in which competing NGOs design and operate labeling schemes in a *horizontal* setting in which schemes can vary in the breadth of behaviors to which they relate.

The *scope* of a labeling scheme—whether it applies to a wide set of behaviors, or a narrower niche behavior—is a crucial design dimension along which NGOs compete for adoption

[1]For instance, the website ecolabelindex.com currently catalogs 463 eco-label schemes. Some commentators remark that 'today there is a Babylon of labeling going on…it's estimated that there are literally thousands of labels in the world today' (Green, 2011, p. 4). In terms of value 16 of the largest producer oriented eco-labeling initiatives in the agricultural sector account for about 36.1 billion US (2012) dollars of product and adoption of these labels is growing rapidly (Potts et al., 2014, p. 27). Sales of certified coffee and tea grew by 433 and 2000 percent respectively from 2005 to 2010 (Steering Committee of the State-of-Knowledge Assessment of Standards and Certification, 2012, p. 9). NGOs are the largest provider of eco-labels, though there are also industry run labels (Vermeer and Michalko, 2010, p. 21). There is a separate and important question as to how NGOs themselves build and maintain a credible reputation for honesty which we ignore.

Figure 1: Example of a *narrow* and a *wide* label.

of their label to produce social impact. The resulting issue of *fragmentation* in NGO certification is one that has been much-debated in practitioner circles. Readers will be familiar with a variety of wide labels that attest to very broad things such as 'sustainability' and 'fair-trade', embodying multiple dimensions of behavior, as well as much more narrowly focused schemes. To illustrate concretely what we have in mind, consider the two labels in Figure 1. On the left side is an example of a *narrow* label (the Smithsonian label that attests to a product having been made in a bird-friendly way), on the right a *wide* label (the WFEN label says a product has been made in a way friendly to wildlife in general, including birds).

Our purpose in this paper is twofold. First, we analyze the decision of an NGO in designing a labeling scheme in a setting characterized by *horizontally differentiated* social issues, with particular focus on the *width* of the label—the set of behaviors that a label covers. Second, we examine the welfare implications of entry and competition between NGOs in the quasi-market for labeling services.

The question of 'what issues get labeled?' is an obvious one but it has been ignored by existing research.[2] While the answer is interesting from the point of view of a positive theory

[2]Every existing paper starts with a pre-determined issue to which a label applies. Most then concentrate on the stringency of the label (e.g., Fischer and Lyon, 2014; Li and v'ant Veld, 2015). The only exception to this is Heyes and Martin (2017) who model some aspects of label performance on a Salop-style circular issue-space. Individual labels in that paper, however, remain single-issue so there is no concept of label width, the focus here. Outside of the literature on label design, there is a literature on quality certification for multi-attribute experience goods (e.g., Dranove and Jin, 2010; Sun, 2011; Bar-Isaac et al., 2012; Ma and Mak, 2014). In these papers, focus lies on the response of a monopolist to information disclosure and consumer learning about the quality of a product when such quality can vary over two dimensions. The model we consider is distinct for two reasons. First, we fix the 'quality' of firms' behavior with respect to social issues: a firm can either behave well or behave poorly for a given social issue. This allows us to focus on the scope

of labels, the relationship between scope and effectiveness of labels is the more compelling normative question. In particular, what is the effect of competition *between* NGOs on the efficacy of a particular labeling scheme, and on the social desirability of the portfolio of labeling schemes that emerge in equilibrium? From a policy perspective, any inability of NGOs to deliver an optimal suite of labeling schemes provides a rationale for regulation of third sector labeling activities.

In examining competition between NGOs over the set of issues addressed by a label, this paper provides a novel perspective on label design and competition between NGO-operated labeling schemes. A major advantage of recognizing the horizontal nature of labels and competition between and entry of NGOs is that questions of label proliferation and fragmentation can be explored.[3] Discussion of proliferation makes no sense in a model without entry, and fragmentation has no meaning in a setting without a horizontal dimension. We show that competition between NGOs generally has a negative effect on the efficiency of labels in the economy. In the presence of competition—or even just the threat of competition—NGOs bring to market the wrong (inefficient) suite of labeling schemes. This results from the interplay of strategic entry and design choices by competing NGOs.[4] From a policy perspective, this result implies that erecting barriers to entry for new certifiers will generally improve

of labels rather than their stringency, the focus of existing literature on label design. Put differently, we focus on horizontal rather than vertical characteristics of the label in a multi-attribute setting. Second, we use our model to analyze the types of labels that competing certifiers design, rather than how firms respond to certification and consumer learning. While this is an important aspect of certification in a multi-attribute setting, we consider a simple model of firm behavior to focus our analysis on NGOs. Since social attributes are rightfully a *credence* characteristic of a good, rather than an experiential characteristic, the interaction with quality and firms' pricing strategies is less interesting for the case of social attributes.

[3]Label proliferation refers to an increase in the number of labeling scheme (that is, entry). Fragmentation refers to the case where a single broad behavior, say, sustainability or environmental responsibility, is decomposed for into a number of narrower sub-behaviors (Steering Committee of the State-of-Knowledge Assessment of Standards and Certification, 2012, p. 51).

[4]To the best of our knowledge this is also the first paper (with the exception of Heyes and Martin (2017)) to allow for entry by NGOs into the labeling arena and discuss label proliferation in a formal model of labeling. By contrast, the model of Heyes and Martin examines the implications of entry of competing scheme on the stringency of labels. The conceptual difference between their model and ours is that we examine the implications of proliferation on the scope of labels, abstracting from stringency. Importance of the interaction between scope of labels and entry is discussed in Auld (2014). Compared to Heyes and Martin, entry of schemes leads to *inefficiency* in the equilibrium set of labels through its interaction with scope, rather than improving welfare by affecting stringency.

welfare.

1.1 Contestability in the Market for Certification: An Illustrative Worked Example

The basic mechanism that underpins our results is worth understanding right from the start, and arises from the potential that an NGO might wish to *leverage* firms by 'bundling' into broad labeling criteria issues that the firm does not necessarily find profitable to address individually, thus inducing the firm to address a broader range of social issues than it would with a narrow label alone.

Despite our reference to the bundling of issues, any resemblance to the IO literature on the bundling of consumer goods (e.g., McAfee et al., 1989; Nalebuff, 2004) is superficial. Not only are the settings, players and objectives distinct, but the insights are quite different. Central to that literature is that bundling can be used as a form of price discrimination, which has no analogue here. In terms of bundling and entry, in the pioneering work of Nalebuff (2004) an incumbent may have an incentive to bundle goods in order to deter entry by single-product competitors. In the current paper, the player facing entry (in this case an NGO) is under pressure to *narrow* or 'unbundle' its offering to discourage entry. Much better analogies to the mechanism at play in our model are the notions of contestability and vulnerability to hit-and-run entry (Baumol et al., 1982), and regulatory 'dealing' by enforcement agencies (Heyes and Rickman, 1999).

For concreteness, consider the following stylized example. Suppose that a firm gets an increase in profit (gross of any outlays required to qualify for the label) equal to \$10m if it carries a label saying that it is bird-friendly and can separately attract another increase equal to \$10m if it is certified elephant-friendly. Further assume that adjusting its production practices to be bird-friendly would cost the firm \$5m, while to be elephant-friendly would cost it \$12m, and that there are no economies or dis-economies of scope between the required adjustments.

If there exists only one certifying NGO that offers a *wide* label requiring both bird- and elephant-friendliness for award, the firm would adjust practices on both dimensions in order to qualify for the label, gaining \$20m - \$17m = \$3m in profit. If we allow for entry of another certifying NGO, however, the competing NGO could introduce a *narrow* scheme that requires *only* bird-friendliness and the firm that we have described would opt out of the wide scheme and into the competing label for a gain of \$10m - \$5m = \$5m > \$3m.

Though the welfare impacts of certification are going to require some additional structure, we can observe immediately that in making such a switch the overall wildlife-friendliness of the firm is diminished. Of course the equation could be complicated if we account (as we do below) for the possibility that firms to vary in how costly they find adherence to each of multiple labeling requirement and there are economies or dis-economies of scope between differentiated pro-social behaviors, and for the costs associated with the operation of labeling schemes, but the example illustrates the potential for deleterious effects from label entry when labels compete in scope. The motivation for the entrant NGO in the model is the assumption—well-established in the literature—that they attach greater weight to social impact associated with their *own* program than the programs of other NGOs.

Through the process described above, niche labels can attract defectors from wide labels. Provided economies of scope for firms in addressing the diverse set of issues are not too large, the market for labels is *contestable* and an entering NGO can have its label adopted by firms that, pre-entry, were being leveraged. However, a forward-looking incumbent NGO will anticipate the possibility of entry when it designs its labeling scheme and may adjust the scheme it puts in place. Depending on the distribution of firm costs, and certain other aspects of the setting, an incumbent NGO may choose to *deter* entry by offering an inefficiently narrow label.[5] Or it might *accommodate* entry, continuing to offer a wide label but facing reduced adoption of its label as potential adopters are drawn to the narrow competitor. Only

[5]Note that this is the opposite of the entry deterrence result when firms can bundle products to consumers as a form of entry deterrence (Nalebuff, 2004; Peitz, 2008). Bundling issues into its label makes an incumbent NGO more susceptible to competition from an entrant because of leveraged firms, and the incumbent would like to un-bundle its label to deter entry.

when entry is *blockaded* will NGOs produce an efficient set of labels, as an incumbent is able to offer a wide label without fear of competitive forces. The key result from the model is that when NGOs design the scope of their label strategically, competition—or even just the threat of competition—causes NGOs to design labels that are not efficient.

While the above results hold for a wide range of parameter values, with sufficient economies of scope entry is always blockaded and an incumbent NGO offers a label that is wide in scope and socially-efficient. With sufficient dis-economies of scope, an incumbent NGO may either accommodate or deter entry by competing label schemes, though here deterrence or accommodation may be welfare-enhancing.

The remainder of the paper proceeds as follows: section 2 presents the core model; section 3 examines competition between NGOs; section 4 concludes. Proofs are in the appendix.

2 Model

2.1 Labeling

Let I be a set of social issues or behaviors (e.g., 'bird-friendliness') on which the behavior of a firm can be categorized as either 'good' or 'bad'. To make matters simple, we consider only two issues so that $I = \{\text{issue } 1, \text{issue } 2\}$.

A *social label*, denoted by L, certifies that the behavior of a firm is good with respect to a subset of the issues in I. For example, to qualify for label $L = \{\text{issue } 1\}$ the behavior of a firm on issue 1 must be 'good'. To streamline notation, let $L_1 = \{\text{issue } 1\}$, $L_2 = \{\text{issue } 2\}$, and $L_{12} = \{\text{issue } 1, \text{issue } 2\}$. We refer to L_1 and L_2 as 'narrow' labels, and L_{12} as 'wide' to keep the notion of scope in mind.[6] The set of labels available is denoted by $\mathcal{L}$.

Associated with each label L is some external benefit $B(L)$ that accrues from addressing

[6]That the wide label is a subset of the narrow label is a consequence of I having only two issues. While it is straightforward to extend our model to allow for more than two issues—and generate equilibria where a narrow label is not a subset of the wide label—the model becomes considerably more complicated. We restrict attention to an issue space with only two issues for simplicity. Importantly, our results are not sensitive to this assumption.

the social issue(s) to which the label relates, such that

$$B(L) = \begin{cases} b & \text{if } L = L_1 \text{ or } L = L_2, \\ 2b & \text{if } L = L_{12}. \end{cases}$$

Generally, this benefit comes from mitigating an externality. If, for example, a label requires that the practices of a firm be carbon-neutral, then the external benefit from adherence might be enumerated by combining a measure of the volume of emissions that would have resulted from business as usual with an estimate of the social cost of carbon.

The assumption that $B(L_1) = B(L_2)$ emphasizes the horizontal nature of issues; one issue is not objectively 'more important' than the other. The assumption that $B(L_{12}) = B(L_1) + B(L_2)$ implies that issues are distinct; dealing with issue 1 does not render dealing with issue 2 any more or less socially valuable. Being nice to birds does not change the value society places on being nice to elephants. This separability keeps the analysis simple while emphasizing the fundamental points.

2.2 Consumers and Firms

In order to focus on the label design problem, we adopt as simple an industry structure as possible. Specifically, assume there is a collection of firms that each sell one unit of output in a global market and can engage in pro-social behavior by adopting 'good' behavior with respect to the social issues in I. Consumers inelastically demand one unit of output and have preferences for a firm's social conduct.[7] Given the credence nature of pro-social behavior, such behavior is only credible in the eyes of consumers if it is externally certified (i.e., labeled). A (representative) consumer's willingness to pay for a good that bears a label

[7] This setup follows that of Heyes and Maxwell (2004) and Fischer and Lyon (2014), and is similar to that in Bottega and De Freitas (2009).

L is denoted by $\Pi(L)$, where

$$\Pi(L) = \begin{cases} \pi & \text{if } L = L_1 \text{ or } L = L_2, \\ 2\pi & \text{if } L = L_{12}. \end{cases}$$

As with external benefits, willingness to pay for a labeled good is assumed separable. This has the sensible implication that consumers' valuation of pro-social behavior is proportional to its social impact.

Bearing the label L on its product allows a firm to extract consumers' willingness to pay for pro-social behavior, generating an increase in profit for the firm of $\Pi(L)$—which is understood to be gross of the costs associated with label adoption. The term $\Pi(L)$ is the increase in the price the firm can charge when bearing label L on its product. It is important to note that this increase in profit comes about from a firm addressing social issues and credibly communicating this behavior to consumers, not from the label itself; if a firm adopts two labels that cover the same issue, they do not get twice as much profit as if they had only adopted one label. Since labeling is voluntary, a firm can always choose to not adopt any label and forgo a price premium for its product. Following existing literature on label design (e.g., Fischer and Lyon, 2014; Li and v'ant Veld, 2015; Heyes and Martin, 2017), our assumptions allows us to ignore the implication of labels for competing firms' strategies and instead focus on NGOs' strategies.[8]

While we frame profitability from adopting a label as coming from a firm extracting consumers' willingness to pay for pro-social behavior, this is not the only mechanism by which a firm can be rewarded for adopting a label. More generally, a label can increase profitability by allowing a firm to credibly communicate its good behavior to *stakeholders*. For example, by adopting a label and credibly signaling its improved social conduct, a firm

[8]See Amacher et al. (2004) for a model that focuses on firms' strategies when they can adopt eco-labels. The assumption that profit from a label does not depend on other firms' label-adoption decisions amounts to a restriction on industry structure, such as perfect competition (Li and v'ant Veld, 2015), Bertrand competition (Heyes and Martin, 2017), or no competition at all (Heyes and Maxwell, 2004; Bottega and De Freitas, 2009; Fischer and Lyon, 2014).

may be able to avoid a costly boycott by a social activist; in this case, the increase in profit from a label comes from a reduction in expected costs from avoiding the activist's campaign. Although we stick with a model in which a firm is rewarded by consumers, noting prevents us from interpreting our model in a broader setting in which firms are rewarded by stakeholder more generally. Essential for us is that a firm receives a boost in profit from engaging in pro-social behavior, and certification by a third party NGO is required for a firm to harvest this reward.[9]

Firms vary in their cost of engaging in pro-social behavior with respect to a particular issue. The cost of good behavior on a particular issue can be either c_h or c_l (high or low), with $c_h > c_l$. Since there are two issues, there are four possible types of firms as defined by the cost of adopting a label. Denote these types by θ_{ll}, θ_{lh}, θ_{hl}, and θ_{hh}, where the first index is the cost (either low or high) of addressing issue 1 and the second index is the cost of addressing issue 2. For example, a firm of type θ_{lh} finds it low cost to deliver good behavior on issue 1 in isolation, high cost on issue 2 in isolation. We denote by $P(\theta)$ the probability that the firm is of type θ and, without loss of generality, assume $P(\theta_{lh}) \geq P(\theta_{hl})$. Generally, it will be the case that $P(\theta_{lh}) > P(\theta_{hl})$.

Letting $C_\theta(L)$ be the cost of complying with a label L for a firm of type θ, the cost of complying with a single-issue label for each type of firm is summarized as follows:

		$C_\theta(L_2)$	
		c_l	c_h
$C_\theta(L_1)$	c_l	θ_{ll}	θ_{lh}
	c_h	θ_{hl}	θ_{hh}

.

[9]We ignore altogether the important issue of NGO credibility. An NGO has a direct interest in maintaining a good reputation and therefore a credible label (see Heyes and Maxwell 2004; Steering Committee of the State-of-Knowledge Assessment of Standards and Certification 2012; Duflo et al. 2013; Auld 2014). While an NGO label may not be perfectly credible, it is typically more credible than direct claims by firms (Bartley, 2011, p. 441). Credibility is a standard assumption in models of label design (Heyes and Maxwell, 2004; Bottega and De Freitas, 2009; Fischer and Lyon, 2014) and certification more generally (Lerner and Tirole, 2006). Dranove and Jin (2010) provide an excellent survey of related issues. These issues are important but not the focus of our analysis here.

The cost of good behavior on both issues is the sum of good behavior for each issue in isolation, plus a term that captures (dis-)economies of scope. Complying with a wide label costs a firm of type θ

$$C_\theta(L_{12}) = C_\theta(L_1) + C_\theta(L_2) + \gamma, \qquad \gamma \in [-2c_l, 2\pi - 2c_l].$$

Here, γ is a measure of economies or dis-economies of scope in pro-social behavior. That γ does not depend on a firm's type is motivated by notion that (dis-)economies of scope depend primarily on the nature of the social issues, not the firm. While firms may differ in their unit cost for addressing any particular issue, what matters for economies of scope are the issues themselves. In this sense γ is rightfully a function of the issue space, such that different issue spaces give different γs, and restrictions on γ should be interpreted as restrictions on the underlying issues in I. The bounds on γ ensure that (a) economies of scope are never so large that a firm faces negative costs to addressing the issues as a pair and (b) at least some firms can adopt a wide label without net loss.

The need to recognize the potential for economies and dis-economies of scope once we move to a certification setting which is multi-dimensional is important, and it is not difficult to think of cases that go either way. It may be that a firm can remove discharge of one pollutant by switching to some substitute pollutant, in which case removing discharges of one in isolation is cheap, but both at the same time would be expensive ($\gamma > 0$). Conversely, reducing one sort of environmental impact might require retooling of a factory, and once operations are suspended to make the adjustments the marginal cost of making further adjustments to address other issues at the same time is reduced ($\gamma < 0$).

Firms are profit-maximizing and so adopt the label(s) from the available set that generates the greatest profit (or no label at all)—a firm of type θ picks a label L from those on offer to maximize $\Pi(L) - C_\theta(L)$. To break ties we assume that if a firm is indifferent between a label $L \in \mathcal{L}$ and no label, the firm chooses L and if a firm is indifferent between a narrow

label and wide label, it chooses the wide. This amounts to saying that if it has zero effect on profit, a firm will err on the side of good behavior not bad.[10]

To keep the problem interesting we focus on cases in which $\pi \in (c_l, c_h)$ and $c_l + c_h < 2\pi$, so that $2\pi - c_l - c_h \in (0, \pi - c_l)$. This is necessary and sufficient to generate a trade-off for an NGO between the scope of a label and its adoption by firms, at least when γ is not too large in absolute value. With this assumption, type θ_{lh} and θ_{hl} firms find a wide label profitable, and hence will adopt it if it turns out to be the only label available. But these firms would prefer a narrow label to a wide label if available (for example, the firm in the simple numerical example sketched in the introduction). The implications of relaxing this assumption are explored in the following sections as γ varies.

Finally, when examining welfare we assume that $b \geq c_h$: pro-social behavior from the firm is always welfare-desirable. This rules out the possibility that a labeling scheme is inefficient because the issue to which it relates is not one that society wishes to be addressed. Coupled with our previous assumptions, this implies that $b > \pi$, so that consumers' willingness to pay for a labeled product does not exceed the external benefit generated from complying with the requirements of the label. This means that π is some fraction of b, which is sensible.[11] When examining welfare, we include π in the social welfare function as this represents consumer surplus that firms are able to appropriate by adopting a label. From society's point of view, the social benefit of good behavior is the external benefit B plus the private benefit Π.[12]

[10]This can come about from, say, the possibility that better social performance by a firm helps to prevent tougher regulation in the future.

[11]π must be some fraction $\beta \in (c_l/b, 1)$ of b; the lower bound on β simply ensures that $\pi > c_l$. Practically, this means that π cannot be too small a fraction of b, for then no firm types would find adopting a label profitable and there is no point in studying such labels.

[12]Consumers' private benefit from purchasing a labeled good could come from higher quality associated with the firm's pro-social behavior, such as with organic food, or from some behavioral motivation, such as 'warm-glow' altruism. While we do not distinguish between these different cases in our welfare analysis, our main results are robust to including only a fraction of π in social welfare.

2.3 NGOs

We formalize competition between two NGOs as a sequential label design game. NGO i (incumbent) moves first by designing a label and NGO e (entrant) moves second, deciding to enter—and if so designing its label—or stay out.[13] Denote by L_i the label offered by NGO i and L_e the label offered by NGO e.

In order to simplify the model and focus on the main results of the paper, assume that NGOs cannot offer identical labels, consistent with the idea that labelers go to considerable effort to differentiate their labels.[14] There are a variety of ways to motivate this assumption. It could stem from consumer confusion over labels, such that NGOs offering identical labels make it difficult for consumers to distinguish the labels, reducing a firm's incentive to adopt a label (Harbaugh et al., 2011). It could also come from the sequential nature of the game, with the incumbent developing 'brand' awareness for its label first, so that a firm is more likely to bear the incumbent's label if an entrant offers the same label as the incumbent.

The objective of an NGO is to design its labeling scheme to maximize the social value of the good behavior done by firms that adopt its label. We refer to such an NGO as being impact-motivated. Letting Θ_i be the collection of firm types that adopt label L_i when label L_e is also on offer, the problem for NGO i is

$$\max_{L_i \in \mathcal{L}} v_i(L_i, L_e) = B(L_i) \sum_{\theta \in \Theta_i} P(\theta) - F,$$

with the problem for NGO e defined analogously, should entry occur. F is a fixed cost of setting up and operating a labeling scheme. An NGO can always choose to not set up a

[13] This structure for competition is motivated by the observation that 'for labeling programs early choices about policy scope and regulatory domain... are expected to factor in explaining whether and in what form new entrants will emerge' (Auld, 2014, p. 50). In other words, the strategic importance of scope in the context of label design comes about from the incentives it creates for NGOs who might subsequently be starting up labeling schemes.

[14] This is a fairly standard assumption for models of label design (e.g., Fischer and Lyon, 2014; Li and v'ant Veld, 2015). Relaxing this assumption does not disturb the central results of the paper, although it makes stating propositions more difficult and requires introducing additional notation—the key insights of the model do not depend on this assumption. Any equilibria in which both NGOs offer the same label are necessarily inefficient as there is a duplication of fixed costs (introduced below).

label, denoted by $L = \emptyset$, earning a payoff of zero.

There is no explicit modeling of costs associated with certification/monitoring. These costs could be borne entirely on firms through C_θ, or benefit B could be treated as being net of any costs of certification. Similarly, the fixed cost F need not represent a financial outlay but can be an opportunity cost associated with the time of the social entrepreneurs.[15] NGOs may also face economies (or dis-economies) of scope when certifying a firm over multiple issues. It may be easier to certify a firm's behavior with respect to an issue if it is already certified for another issue. If firms bear the entire cost of certification, then the economies of scope parameter γ may be (partially) a reflection of certifiers' economies of scope in certification.

That an NGO is only concerned with the impact generated by its label corresponds to the notion of 'impact philanthropy' (Duncan, 2004) and is fairly standard in models of NGOs (e.g., Aldashev and Verdier, 2010); Scharf (2014, p. 50) further motivates such an assumption, citing impure altruism on the part of social entrepreneurs. (See Heyes and Maxwell (2004), Bottega and De Freitas (2009), Fischer and Lyon (2014), and Li and v'ant Veld (2015) for examples where a similar objective is used in the context of label design.) The role of the assumption of an impact motivated NGO will become more apparent in the following section when there are multiple, competing NGOs. A softer variant of this assumption, under which the main qualitative results of the paper would be sustained, would be if each NGO valued the impact of other NGOs, but tended to weigh more heavily those directly attributable to its own programs.

Total social surplus from a pair of labeling schemes (L_i, L_e) is simply the external benefit associated with addressing social issues in L_i and L_e, less the cost associated with addressing these issues, plus consumers' willingness to pay for labeled products (equivalently, firms' increase in profit from acting in a socially-responsible way). Letting Θ_i be the set of firm types that adopt label i and Θ_e be the set of firm types that adopt label e, this can be

[15]The source of an NGO's funding is also left unspecified; it is standard in the literature to regard NGOs as fully funded (Heyes and Maxwell, 2004; Fischer and Lyon, 2014).

written as

$$s(L_i, L_e) = \sum_{\theta \in \Theta_i} [B(L_i) - C_\theta(L_i) + \Pi(L_i)]P(\theta) + \sum_{\theta \in \Theta_e} [B(L_e) - C_\theta(L_e) + \Pi(L_e)]P(\theta) - 2F.$$

2.4 Timing

As already mentioned, competition between labelers takes the form of a sequential game in which NGO i (incumbent) moves first, followed by NGO e (entrant). We will demonstrate later that the main results are robust to allowing for more than one potential entrant. Firms move last, choosing whether or not to adopt one (or more) of the labels on offer from the set of labels and sell their output to consumers. In all cases we solve backwards for sub-game perfect Nash equilibria (SPNE).

3 Competing Labeling Schemes

3.1 A Focal Case ($\gamma = 0$)

As a special case, consider $\gamma = 0$ so that there are no economies or dis-economies of scope when addressing multiple social issues. This case embodies the flavor of the more general analysis with a minimum of fuss and makes for a simpler presentation and statement of results—the next section relaxes this restriction.

In general, an NGO must take account of how the design of its label will influence firms' decision to adopt it relative to competing labeling schemes (or no label at all). For the moment, however, we consider the incentives facing a single NGO which operates without the need to consider competition from other NGOs—the NGO is analogous to a statutory monopolist in the industrial organization literature. This provides a benchmark against which the competitive outcome can be compared.

Restricting attention to settings in which a monopoly NGO finds it worthwhile to launch at least a narrow label (i.e., $P(\theta_{ll}) + P(\theta_{lh}) \geq F/b$), if the NGO launches L_1 then only firms

of type θ_{ll} and θ_{lh} adopt the label, whereas if the NGO launches L_2, only firms of type θ_{ll} and θ_{hl} adopt it. By our convention there are more θ_{lh}-types than θ_{hl}-types so an NGO will never wish to offer L_2. If the NGO launches L_{12}, however, then all firm types except θ_{hh} adopt the label; even though a type θ_{lh} or θ_{hl} firm does not find it profitable to address one of the two issues demanded by the label, it is still profitable overall to adopt the wide label. As such, a monopoly NGO will launch a wide label when there are no (dis-)economies of scope.

In order to make the monopoly NGO case a useful benchmark, the following lemma establishes that a single wide label is efficient (among the set of possible labels $\mathcal{L}$) when there can be multiple NGOs offering labels.

Lemma 1. *When there are no economies or dis-economies of scope between pro-social behaviors, the label offered by a monopoly NGO is welfare-efficient (i.e., $(L_i, L_e) = (L_{12}, \emptyset)$ is efficient when $\gamma = 0$).*

Intuitively, since producing social benefit is socially desirable (recall that $b \geq c_h$ by assumption), a social planner would like to design a label that induces as much pro-social behavior from firms as possible and not give firms the opportunity to choose a label that produces lower social impact, hence a single wide label. Since the monopoly NGO faces no competition for firms to adopt its label, and a wide label produces maximal social impact, the monopoly NGO designs an efficient label.

Having established the benchmark case when there is no competition, we now move to the competitive case. In looking at the outcome of a competitive equilibrium there are three possible types of equilibria that can emerge, depending on the proportion of firm types. In each case what matters is the number of *leveraged* firms—those that find adopting a wide label profitable, but would prefer a narrow label (i.e., type θ_{lh} and θ_{hl} firms). These firms will adopt a wide label if it is the only one on offer, but would prefer a narrow label focused on the behavior which they find cheapest. It is these leveraged firms that provide a strategic link between the label of the incumbent and the actions of the entrant. We consider each of

these three types of equilibria in turn, showing that competition results in an inefficient set of labels.

Entry Deterrence

The first possibility is that leveraged firms are decisive in determining the sort of label an NGO will design—if an incumbent does not design a label to appease these firms, an entrant can design a more attractive label, displacing altogether the label of the incumbent. Anticipating this the incumbent designs a narrow label to deter entry. This outcome hinges on their being a sufficient proportion of these leveraged firms; the entrant will only launch a narrow scheme if the number of firms that adopt its label is sufficient to justify the fixed cost of establishing the scheme.

Proposition 1 (Inefficient deterred entry)**.** *If enough firms find it cheaper to engage in one* ***particular*** *pro-social behavior than the other, then the incumbent NGO designs a narrow label focused on that behavior. In so doing it deters entry of another NGO. Concretely, if* $P(\theta_{lh}) \geq F/b$ *and* $P(\theta_{ll}) + P(\theta_{hl}) < F/(2b)$ *then* $(L_i^*, L_e^*) = (L_1, \emptyset)$ *in the unique SPNE. The set of labels in equilibrium is welfare-inefficient.*

The reason that competition does not produce an efficient outcome is that the incumbent NGO finds it profitable to choose $L_i^* = L_1$ and block entry by a narrow competitor. (Recall from lemma 1 that the wide label is the efficient one.) The welfare-motivated planner would rather it operated a wide label, as it would if there were no threat of competition, and that the entrant stayed out. While there are still the same number of leveraged firms if a monopoly NGO launches a wide label, because there is no threat of competition these firms do not influence a monopoly's choice of label.

Such a reaction on the part of the incumbent NGO has the flavor of a contestable market (Baumol et al., 1982). Counter to the case of a contestable market, however, contestability in labeling leads to welfare *in*efficiency. This corresponds to the counter-intuitive role of market demand for labels identified by Auld (2014), where labelers face the 'top-down challenge of

courting potential supporters and preventing entry by competing programs' (Auld, 2014, p. 13). However, this contestability type story is not the only way in which competition between NGOs can generate inefficient results, which leads to the second possibility.

Accommodation

Consider a setting in which leveraged firms still constitute a large fraction of firm types, but there is greater heterogeneity among these firms in terms of preferred behavior (that is, which pro-social behavior respective firms find cheaper to engage in). This means that there are more type θ_{hl} firms relative to θ_{lh} firms than above (in proposition 1). While heterogeneity means that leveraged firms are no longer decisive, the large number of leveraged firms still makes entry attractive.

Proposition 2 (Inefficient accommodated entry)**.** *If enough firms find it cheaper to engage in one pro-social behavior than the other, but* ***vary*** *in which behavior is cheaper, then the incumbent NGO accommodates entry. In equilibrium two labels operate, one narrow and one wide. Concretely, if* $P(\theta_{lh}) \geq F/b$ *and* $P(\theta_{ll})+P(\theta_{hl}) \geq P(\theta_{lh})/2$ *then* $(L_i^*, L_e^*) = (L_{12}, L_1)$ *in the unique SPNE. Similarly, if* $P(\theta_{ll})+P(\theta_{hl}) \in [F/(2b), P(\theta_{lh})/2)$ *then* $(L_i^*, L_e^*) = (L_1, L_{12})$*. The set of labels in equilibrium is welfare-inefficient.*

This result serves to emphasize the general nature of the inefficiency that comes from competition between NGOs: leveraging of firms. For instance, if the incumbent NGO chooses the efficient (wide) label, some firms (the type θ_{lh} firms) are leveraged, causing them to adopt a socially inefficient, narrow label if offered by the entrant. Provided there are enough such firms, the entrant does indeed enter with such a narrow label. Comparing again with the benchmark of a monopoly NGO, even if the incumbent decides to offers the (efficient) wide label, a competitor can offer a narrow label that appeals to certain firms and dilute the social impact of the wide label.

Blockaded Entry

The final possibility is that the number of leveraged firms is so low that it does not influence the label design decision of the incumbent NGO. In this case there is no meaningful strategic interaction between the NGOs, delivering the following.

Proposition 3 (Efficient blockaded entry)**.** *If an insufficient fraction of firms prefer addressing only one issue then the incumbent NGO designs a wide label and entry is blockaded. The incumbent acts as a monopolist insulated from the threat of competition. Concretely, if* $P(\theta_{lh}) < F/b$ *then* $(L_i^*, L_e^*) = (L_{12}, \emptyset)$ *in the unique SPNE. The set of labels in equilibrium is welfare-efficient.*

In effect, then, whenever there is meaningful strategic inter-dependence between the NGOs, the result is a socially-inefficient set of labeling schemes. Only in this last case do the NGOs make non-cooperative label design choices that deliver the suite of labeling schemes that a welfare-motivated planner would wish to see. But this occurs precisely because entry is blockaded and the incumbent can act as a monopolist. Taken together, propositions 1 to 3 imply that competition results in an inefficient set of labels.

Figure 2 illustrates how the above three propositions partition the space of firm types. Fixing the number of type θ_{hh} firms, that never adopt a label anyways, the share of each firm type can be represented on the surface of a tetrahedron with vertices of length $1-P(\theta_{hh})$, and this surface can be partitioned to illustrate where in the space of firm types each equilibrium will occur. (Recall that $P(\theta_{lh}) \geq P(\theta_{hl})$ by assumption, so that the type space is 'cut in half', hence the dashed lines in the figure; since types θ_{lh} and θ_{hl} are symmetric, this is without loss of generality.) Moving from the top of the type space to the bottom moves the equilibrium from one in which there is only a narrow label, to one in which there is a narrow label and a wide label, and finally to one in which there is only a wide label. Simultaneously, the equilibrium moves from one in which entry is deterred, to one in which entry is accommodated, and finally to one in which entry is blockaded.[16]

[16]Moving from the top of the type space to the bottom of the type space also increases the association

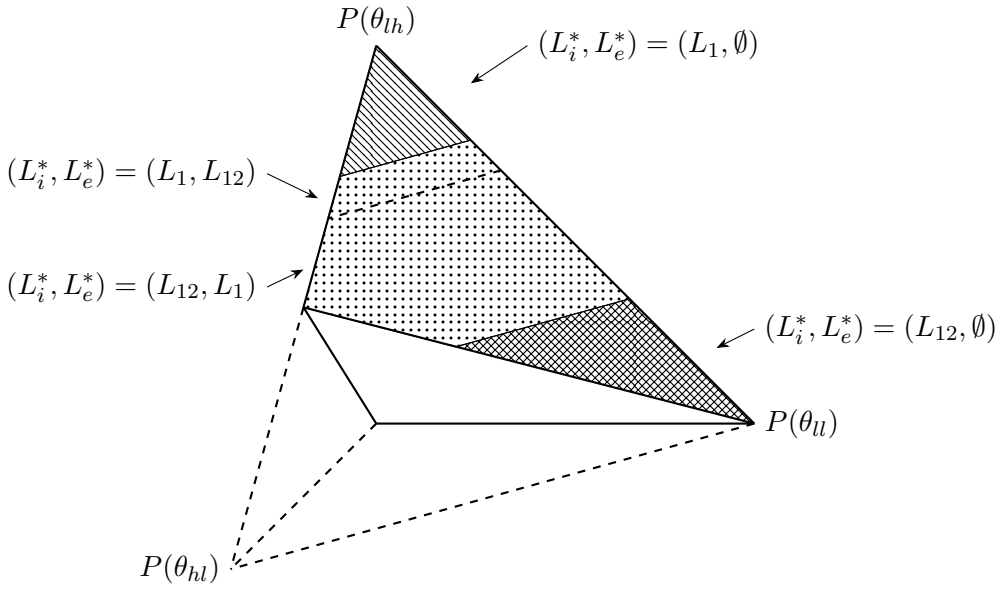

Figure 2: Partition of the type space according to the propositions. Top region (lines) corresponds to proposition 1; middle region (dots) corresponds to proposition 2; bottom region (hatched) corresponds to proposition 3. Dashed line in the dotted region separated the two cases in proposition 2.

Underlying the logic in both propositions 1 and 2 is the ability of the entrant to induce defection from leveraged (actually or prospectively) firms. In this way the entrant comes to act in the interest of firms in the sense that the scheme operated by the entrant NGO is identical to that which would be run by an *industry* certifier (should one exists) motivated by maximizing industry profits, as in Fischer and Lyon (2014).

Remark 1. *When the entrant NGO chooses to operate a labeling scheme, this scheme is indistinguishable from an industry-operated label.*

The above remark gives rise to an interesting interpretation of an entering NGO. The scheme of the entrant can be thought of as having been 'started by' leveraged firms (or by the NGO on behalf of those firms) in response to an incumbent NGO's label. This is consistent with the idea that 'NGOs, companies, and auditors, among others, have two options: they

between costs for the different types of issues; that is, holding $P(\theta_{hl})$ fixed, it becomes more likely that $P(\theta_{ll}) + P(\theta_{hh}) \geq P(\theta_{lh}) + P(\theta_{hl})$. In this way, when there is a positive correlation in costs between issues, it is more likely that entry is blockaded, whereas with a negative correlation it is more likely that entry is either deterred or accommodated.

can participate in or support an existing program, or they can form a new program to complement or compete with existing programs.' (Auld, 2014, p. 50).

Remark 1 allows us to compare proposition 2 with the results in Fischer and Lyon (2014), where an industry group and a competing environmental NGO strategically design the stringency of their labels. Compared to a setting in which labelers compete on the stringency of their label, competition in the scope of labels leads to an unambiguous decrease in firms' social performance and welfare. Intuitively, by acting in the interests of firms, a competitor enables leveraged firms to select a less impacful (i.e., narrow) label that they nonetheless find more profitable, to the detriment of all firms' social conduct. By contrast, in Fischer and Lyon (2014) competition with an industry group can lead more firms to adopt a label, producing greater social impact and welfare. Similar comments apply to the work by Li and v'ant Veld (2015), where competition between an NGO and industry group label can improve welfare.

The above results also relate to the paper by Heyes and Martin (2017). With competing NGOs (competing on the stringency of their labels), entry has the effect of improving welfare by helping to mitigate a race to the top in labels' standards. In contrast, when labelers compete in scope the effect is reversed, and even the threat of competition leads to a reduction in welfare compared to a monopoly NGO.

While only the case of a single entrant has been considered, it is straightforward to incorporate two entrants in the model. Restricting attention to a single entrant minimizes the number of cases to consider and delivers the essential results and intuition, as well as giving the best chance for NGOs to deliver an efficient outcome. Having two entrants would only affect proposition 2, adding cases in which there is one wide labels and two narrow labels, and two narrow labels. The normative results of this section are unchanged, as these additional equilibria are inefficient.

Before moving on and considering the implications of (dis-)economies of scope in addressing issues, it is useful to reflect on how the model helps to explain the structure of the

labeling market for fisheries and forestry. As noted in Auld (2014), the Marine Stewardship Council (MSC) was the incumbent certifier for wild catch fisheries until the Friends of the Sea (FoS) emerged to certify both wild catch *and* aquaculture, the only label of its kind. In the context of our model, this corresponds to the equilibrium in proposition 2 in which the incumbent offers a narrow label, accommodating an entrant that offers a wide label. Our model can explain this structure in terms of how costly fisheries find addressing environmental issues with respect to wild catch and aquaculture, with the MSC offering a narrow label because of the preponderance of fisheries that find addressing issues associated with wild catch easier than with aquaculture. However, this leaves a gap in the incumbent's coverage, leaving room for an entrant to come in with a wide label. While the MSC would like to deter entry by designing a label that appeals to fisheries that would be leveraged by a wide label, there are enough fisheries interested in addressing issues associated with aquaculture to allows the FoS to enter and setup a wide label.

For forestry, the Forest Stewardship Council initially set up a broad, international label, focused on the environmental implications of forestry practices. In response to this label, however, the industry standard SFI emerged in the US to focus on particular domestic issues (Turcotte et al., 2012). As with fisheries, proposition 2 applies in this case, although now it is the incumbent NGO offering a wide label, with an industry label emerging in response. Our model attributes this strategy on the part of the entrant to the presence of leveraged firms—when the incumbent bundles an issue into its wide label that a sufficient proposition of firms find onerous to comply with, these firms may collectively start their own, narrow label.

3.2 The General Case ($\gamma \neq 0$)

The $\gamma = 0$ case provided most of the insight that we deliver in this paper, in particular the more or less generic result that allowing for competition among NGOs generates *inefficiency* in the market for labeling services. This causes us to be less optimistic about the welfare

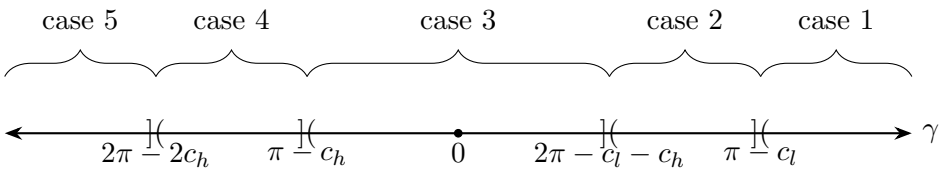

Figure 3: Economies or dis-economies of scope.

gains that should be expected from NGO-operated labels than is the extant literature.

In this section we present the general case, allowing for the possibility of economies or dis-economies of scope between pro-social activities. While many of the earlier results are sustained, the $\gamma \neq 0$ case does generate an additional set of possibilities. In particular, sufficiently pronounced dis-economies of scope introduces the possibility that competition, or even just the threat of competition, can be *good* for welfare. As such our focus is on how the equilibria in proposition 1 to 3 change as a result of introducing (dis-)economies of scope, rather than an exhaustive analysis of all equilibria as in the previous section.

In examining competition generally, there are several cases to consider, depending on (dis-)economies of scope: (1) $\gamma \in (\pi - c_l, 2\pi - 2c_l]$, (2) $\gamma \in (2\pi - c_l - c_h, \pi - c_l]$, (3) $\gamma \in (\pi - c_h, 2\pi - c_l - c_h]$, (4) $\gamma \in (2\pi - 2c_h, \pi - c_h]$, and (5) $\gamma \in [-2c_l, 2\pi - 2c_h]$. See figure 3.

Most of these we can ignore, however. For case (3) the analysis is the same as when $\gamma = 0$, and we do not repeat it here. As before, the wide label offered by a monopoly NGO is efficient and so all the normative analysis for case (3) is the same as when $\gamma = 0$.[17] Cases (2), (4), and (5) are of little interest because they imply no meaningful strategic interaction between the NGOs—there are no leveraged firms in any of these cases. The presence of economies of scope simply allows for more general conditions under which entry is blockaded and an efficient suite of labels emerge. For cases (4) and (5), proposition 3 can be extended as follows.

Proposition 4 (Efficient blockaded entry)**.** *If there are sufficient economies of scope between*

[17]The proof of lemma 1 is identical.

the pro-social behaviors, the incumbent NGO designs a wide label which blockades entry. Concretely, for cases (4) and (5) $(L_i^*, L_e^*) = (L_{12}, \emptyset)$ *in the unique SPNE. The set of labels in equilibrium is welfare-efficient.*

This proposition is intuitive: with sufficiently pronounced economies of scope between behaviors, no firm will find it attractive to adopt a narrow label and so miss out on exploiting economies of scope. The incumbent NGO can launch a wide label with no threat of entry of a competing labeling scheme. This label achieves the same social impact as in the case with no economies of scope, and does so at lower cost to society, making it efficient. Consistent with the analysis so far, a single NGO insulated from competitive forces delivers the efficient outcome.

While all the conclusions of the $\gamma = 0$ case continue to hold for a range of dis-economies of scope, sufficiently large dis-economies can lead to new types of equilibria and, significantly for us, the possibility that competition between NGOs is welfare-enhancing.

In case (1), γ is negative and large enough that no firm would prefer the wide label. Paralleling lemma 1, the following lemma establishes the kind of label that a monopoly NGO would design and gives us a benchmark for competition.

Lemma 2. *For case (1), a monopoly NGO designs a narrow label* L_1 *if and only if* $P(\theta_{ll}) < P(\theta_{lh})$*, otherwise it offers a wide label. If the NGO designs a narrow label, it produces greater surplus than a wide label, but not vice versa.*

Compared to the previous cases considered, with sufficient dis-economies of scope a monopoly NGO may design a narrow label. If the NGO does design a narrow label, it is necessarily more efficient than a wide label. Dis-economies of scope, however, introduces the possibility that the monopoly NGO may instead wish to offer a wide label, even though this label is inefficient. Intuitively, this inefficiency can occur because an NGO does not internalize the cost firms pay for complying with the requirements of the label. With a wide label and large dis-economies of scope, these costs can be large, and while a narrow label

produces less social benefit, it is nonetheless better for society. In such a setting competition between labelers can lead to a socially more desirable outcome by causing NGOs to offer narrow labels.

Considering competing labelers, entry can be either deterred or accommodated as before, and the interpretation of when these cases arises is the same as in propositions 1 and 2. What's new, however, is that with sufficient dis-economies of scope it can be that only narrow labels emerge in equilibrium.

Proposition 5 (Narrow labels)**.** *Let there be dis-economies of scope between the pro-social behaviors captured by* $\gamma \in (\pi - c_l, 2\pi - 2c_l]$*. If* $P(\theta_{ll}) + P(\theta_{hl}) < F/b$ *then* $(L_i^*, L_e^*) = (L_1, \emptyset)$ *in the unique SPNE and if* $P(\theta_{ll}) + P(\theta_{hl}) \geq F/b$ *then* $(L_i^*, L_e^*) = (L_1, L_2)$ *in the unique SPNE.*

The welfare properties of these outcomes are less straightforward to discern than in earlier cases. Recall, however, that with sufficient dis-economies of scope a monopoly NGO may not design an efficient label, introducing the possibility that competitive forces may induce NGOs to design efficient labels. Comparing competitive NGOs with a monopoly NGO, if (and only if) $P(\theta_{ll}) \geq P(\theta_{lh})$ then a monopoly NGO will choose the wide label L_{12}. However, it may not be the case that $s(L_1) > s(L_{12})$, with competition providing a *better* outcome socially if and only if this inequality is satisfied. Intuitively, θ_{ll}-type firms will adopt a wide label if it is the only scheme available, but dis-economies of scope render such a label inefficient. In particular, in this case the *threat of entry by a competing labeling scheme* may be sufficient to produce an efficient outcome. Sufficient conditions for this are summarized as follows.

Proposition 6 (Welfare-improving preemption)**.** *Given the conditions of proposition 5,* $s(L_1, \emptyset) > s(L_{12}, \emptyset)$ *if* $[\pi - c_l + b]P(\theta_{lh}) > bP(\theta_{ll})$ *so that competition between labeling schemes increases welfare. In words, if* $P(\theta_{ll}) - P(\theta_{lh})$ *is positive but not 'too large' the incumbent NGO designs a narrow label to preempt entry of a competing scheme. This produces greater welfare than the outcome under a monopoly NGO.*

The existence of sufficiently pronounced dis-economies of scope also generates the possibility of complementary (or non-overlapping) labels. Provided the cost of operating a label is not excessive, complementary labels can also improve welfare. This is summarized as follows.

Proposition 7 (Welfare-improving accommodation)**.** *Given the conditions of proposition 5,* $s(L_1, L_2) > \max\{s(L_{12}, \emptyset), s(L_1, \emptyset)\}$ *if* $[\pi - c_l + b][P(\theta_{ll}) + P(\theta_{hl})] > F$*. In words, if the fixed costs of operating a labeling scheme are sufficiently small, the incumbent NGO accommodates entry with the entrant choosing a complementary label. This produces greater welfare than the outcome under a monopoly NGO.*

In contrast to the previous analysis when dis-economies of scope were either small or non-existent, competition between labelers can lead to an increase in welfare with large dis-economies of scope.

3.3 Discussion

As mentioned in the introduction, since our model explicitly recognizes both the scope of labels and entry of certifiers, the results of our model can cast some light on the recent phenomena of label *proliferation* and *fragmentation*.

Provided dis-economies of scope in addressing issues are not too large, the entry of new certifiers is inefficient, barring some pre-existing inefficiency in addressing issues (propositions 1 and 2). Entry has the effect of encouraging narrow labels that do not demand enough from firms, fragmenting the set of labels firms can adopt. This means that proliferation of labels is inefficient when NGOs choose the scope of their labels. This contrasts with existing literature, where proliferation of labels improves welfare when NGOs choose the stringency of their labels (Heyes and Martin, 2017). While the notion that proliferation of labels is inefficient is not new, in our setting it comes about from the contestability of labels, rather than a race-to-the-bottom in the stringency of labels (e.g., Bartley, 2011; Auld, 2014) or consumer confusion over labels (Harbaugh et al., 2011).

The mechanism underpinning this fragmentation is that firms can be leveraged. Heterogeneity in how costly firms find engaging in pro-social behaviors of different types allows for an entering NGO to compete by offering a 'predatory' label. In this way natural barriers to entry, such as economies of scope for firms or a particular distribution of firm types, can serve to mitigate the inefficiency generated by inter-NGO competition and induce an efficient suite of labels. *Necessary* for (the threat of) competition to produce a superior outcome compared to a monopoly NGO is that there are sufficiently pronounced dis-economies of scope in addressing issues (proposition 5).

The results of the model also point to the possible emergence of multiple labels applied to the same issue, which is inefficient. The conception of fragmentation as the scope of individual labels becoming narrow, and this representing a potential impediment for adoption by firms (Steering Committee of the State-of-Knowledge Assessment of Standards and Certification, 2012, pp. 47, 51), is confirmed in proposition 2. Recall, the coexistence of a wide and narrow label in equilibrium induces some firms (the θ_{lh} types) to make a welfare-inefficient label choice. If there is overlap in the scope of labels because of label fragmentation, then some firms will adopt a label with a narrower scope and engage in less pro-social behavior than they otherwise would. As such the model provides analytic support for the common practitioner view that label fragmentation is undesirable.[18]

It is important to point out, however, that proliferation and fragmentation of labels are not the only reasons why labels can be inefficient. As seen in proposition 1, contestability and the *threat* of entry is sufficient to produce an inefficient outcome.

[18]It is worth emphasizing that the possibility of label confusion is *not* a feature of the model. The case against the growth in the number of schemes is sometimes based on the possible confusion that would be induced (Steering Committee of the State-of-Knowledge Assessment of Standards and Certification, 2012, pp. 47, 49-51, 105). Harbaugh et al. (2011) provide useful insights into inefficiency due to such confusion.

4 Conclusions

NGO-operated environmental and social labeling schemes are now a key feature of the landscape within which many firms operate. All sorts of stakeholders are willing to reward a firm that goes about its business in a 'responsible' way, *provided* that this behavior is certified. We provide the first formal analysis of the incentives facing an NGO in designing the scope of its labeling scheme in a setting in which it competes with other NGOs for adoptions and impact. This allows us to cast light on recent practitioner debates about *proliferation* and *fragmentation* in the market for certification.

While we do not restate the results of our analysis here, a consistent theme is that we should not expect—except in quite particular circumstances—NGOs to deliver a desirable suite of labeling schemes. In a setting in which prospective certifiers can enter and set up a label, competition, actual or anticipated, between schemes serves to make things *worse*. This provides a prima facie case for policy intervention in the traditionally unregulated sphere of NGO certification services.

Appendix

Proof of lemma 1. It suffices to show that $s(L_{12}, \emptyset) > s(L_{12}, L_1) \geq s(L_1, L_2)$. Surplus from $(L_i, L_e) = (L_{12}, L_1)$ is

$$2[\pi + b][P(\theta_{ll}) + P(\theta_{hl})] - [2c_l + \gamma]P(\theta_{ll}) - [c_l + c_h + \gamma]P(\theta_{hl}) + [\pi - c_l + b]P(\theta_{lh}) - 2F.$$

It follows that $s(L_{12}, L_1) \geq s(L_{12}, \emptyset)$ if and only if

$$\gamma \geq \frac{F}{P(\theta_{lh})} + \pi - c_h + b. \tag{1}$$

It follows that

$$\frac{F}{P(\theta_{lh})} + \pi - c_h + b > 2\pi - c_l - c_h$$

if $b \geq \pi$ so that any γ that satisfies (1) must be (strictly) greater than $2\pi - c_l - c_h \geq 0$.

Surplus from $(L_i, L_e) = (L_1, L_2)$ is

$$[\pi + b - c_l][2P(\theta_{ll}) + P(\theta_{lh}) + P(\theta_{hl})] - 2F.$$

It follows that $s(L_{12}, L_1) > s(L_1, L_2)$ if and only if

$$[b + \pi - c_l - \gamma]P(\theta_{lh}) + [b + \pi - c_h - \gamma]P(\theta_{hl}) \geq 0. \tag{2}$$

Since $\gamma \leq 2\pi - c_l - c_h$, (2) is true if $b \geq \pi$. □

Proof of proposition 1. The assumptions in the proposition imply that $b[P(\theta_{ll}) + P(\theta_{lh})] \geq F$ and $2b[P(\theta_{ll}) + P(\theta_{hl})] < F$. NGO i will never play $L_i = L_2$ since $P(\theta_{lh}) > P(\theta_{hl})$ (i.e.,

$L_i = L_2$ is dominated by $L_i = L_{12}$). If i plays $L_i = L_{12}$, then e plays $L_e = L_1$ so that

$$v_i(L_i, L_e) = 2b[P(\theta_{ll}) + P(\theta_{hl})] - F < 0$$

and

$$v_e(L_i, L_e) = bP(\theta_{lh}) - F \geq 0.$$

If i plays $L_i = L_1$, then e plays $L_e = \emptyset$ so that

$$v_i(L_i, L_e) = b[P(\theta_{ll}) + P(\theta_{lh})] - F \geq 0.$$

The sub-game perfect Nash equilibrium thus has $(L_i^*, L_e^*) = (L_1, \emptyset)$. □

Proof of proposition 2. First consider $2b[P(\theta_{ll}) + P(\theta_{hl})] - F \geq bP(\theta_{lh}) - F \geq 0$. As before, $L_i = L_2$ is a dominated strategy for i. If i plays $L_i = L_1$, then e plays $L_e = L_{12}$ so that

$$v_i(L_i, L_e) = bP(\theta_{lh}) - F \geq 0$$

and

$$v_e(L_i, L_e) = 2b\left[P(\theta_{ll}) + P(\theta_{hl})\right] - F \geq 0.$$

If i plays $L_i = L_{12}$ then e plays $L_e = L_1$ so that

$$v_i(L_i, L_e) = 2b[P(\theta_{ll}) + P(\theta_{hl})] - F \geq bP(\theta_{lh}) - F$$

and

$$v_e(L_i, L_e) = bP(\theta_{lh}) - F \geq 0.$$

As such the sub-game perfect Nash equilibrium has $(L_i^*, L_e^*) = (L_{12}, L_1)$. Similarly, if $0 \leq 2b\left[P(\theta_{ll}) + P(\theta_{hl})\right] - F < bP(\theta_{lh}) - F$, then $(L_i^*, L_e^*) = (L_1, L_{12})$ in the sub-game perfect Nash equilibrium. □

Proof of proposition 3. If i plays $L_i = L_{12}$, then e plays $L_e = \emptyset$ so that

$$v_i(L_i, L_e) = 2b[P(\theta_{ll}) + P(\theta_{lh}) + P(\theta_{hl})] - F.$$

The maximum payoff i can get from playing $L_i = L_1$ is

$$v_i(L_i, L_e) = b[P(\theta_{ll}) + P(\theta_{lh})] - F$$

and so $(L_i^*, L_e^*) = (L_{12}, \emptyset)$ in the sub-game perfect Nash equilibrium. □

Proof of Remark 1. If the incumbent offers L_{12}, an entrant maximizes industry profit by offering L_1; if the incumbent offers L_1, an entrant maximizes industry profit by offering L_{12}. □

Proof of Proposition 4. For cases (4) and (5), proof of the equilibrium strategy is trivial; efficiency follows from lemma 1. □

Proof of lemma 2. For case (1), it is straightforward to show that $L^* = L_1$ if and only if $P(\theta_{ll}) < P(\theta_{lh})$. Now the wide label is efficient if and only if

$$\frac{P(\theta_{ll}) - P(\theta_{lh})}{P(\theta_{ll})}[\pi - c_l + b] \geq \gamma.$$

If $L^* = L_1$ then $P(\theta_{ll}) < P(\theta_{lh})$ so that

$$\frac{P(\theta_{ll}) - P(\theta_{lh})}{P(\theta_{ll})}[\pi - c_l + b] < 0,$$

but $\gamma > 0$ for case (1) and so $L^* = L_1$ is efficient. □

Proof of proposition 5. Note that $L_i = L_1$ is a dominant strategy for i. If $P(\theta_{hl}) < \frac{F}{b} - P(\theta_{ll})$ then e plays $L_e = \emptyset$ and if $P(\theta_{hl}) \geq \frac{F}{b} - P(\theta_{ll})$ then e plays $L_e = L_2$.

For $(L_i, L_e) = (L_1, \emptyset)$, $s(L_1, \emptyset) \leq s(L_{12}, \emptyset)$ if and only if

$$[\pi - c_l + b][P(\theta_{ll}) - P(\theta_{lh})] \geq \gamma P(\theta_{ll}),$$

which need not be true generally. For $(L_i, L_e) = (L_1, L_2)$, $s(L_1, L_2) \leq s(L_{12}, \emptyset)$ if and only if

$$F - [\pi - c_l + b][P(\theta_{lh}) + P(\theta_{hl})] \geq \gamma P(\theta_{ll})$$

which again need not be generally true. □

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